



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**CO-ORDINATED SCIENCES**

**0654/23**

Paper 2 Multiple Choice (Extended)

**May/June 2018**

**45 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

\* 5 7 5 8 7 8 6 0 9 7 \*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

**DO NOT WRITE IN ANY BARCODES.**

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

This document consists of **16** printed pages.

1 Which rows correctly match characteristics of living things with their descriptions?

	characteristic	description
1	excretion	removing the waste products of metabolism
2	growth	making more living things of the same type
3	nutrition	taking in or producing food
4	respiration	releasing energy from food

**A** 1, 2 and 4    **B** 1, 3 and 4    **C** 1 and 3 only    **D** 2 and 4 only

2 Which statement about cells is correct?

- A** Cell membranes are found only in animal cells.
- B** Cell membranes are found only in plant cells.
- C** Cell walls are found only in animal cells.
- D** Cell walls are found only in plant cells.

3 The diagram shows a functional human enzyme at 37°C.



Which row shows the likely shape of this enzyme at two different temperatures?

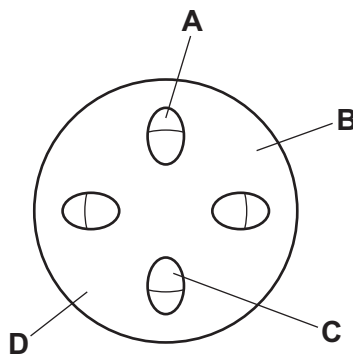
	at 0°C	at 80°C
<b>A</b>		
<b>B</b>		
<b>C</b>		
<b>D</b>		

- 4 A sample of bile was added to some fat in a test-tube at room temperature and left for one hour.

Which will happen in the test-tube?

- A The fat will have decreased surface area.  
 B The fat will have been digested.  
 C The fat will have been emulsified.  
 D The fat will have dissolved.
- 5 The cut end of a leafy stem of a plant was placed in a beaker of red-coloured water. Some time later, a transverse section of its stem was cut.

Which part of the section would be coloured red?



- 6 How does anaerobic respiration differ from aerobic respiration in muscles?

	produces more carbon dioxide	releases less energy
A	✓	✓
B	✓	x
C	x	✓
D	x	x

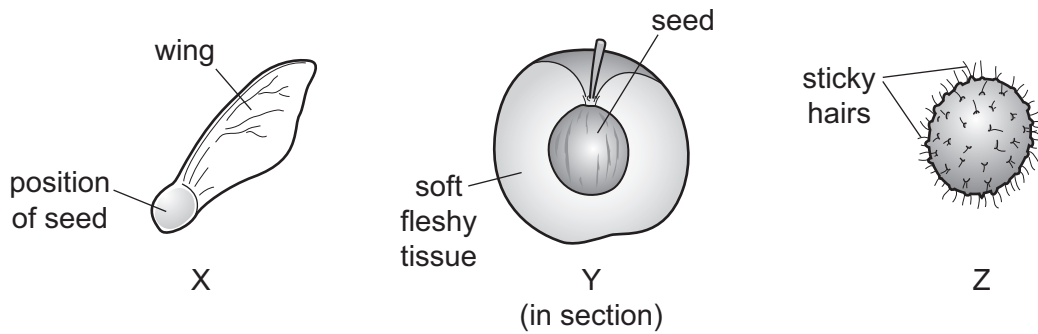
- 7 Which statement about the hormone adrenaline is correct?

- A Adrenaline decreases blood glucose concentration.  
 B Adrenaline is carried by the blood.  
 C Adrenaline is destroyed by the kidneys.  
 D Adrenaline slows down the heart rate.

8 What is secreted by the pancreas?

- A glucagon
- B glucose
- C glycerol
- D glycogen

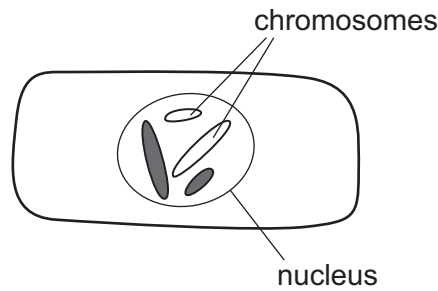
9 The diagrams show three fruits.



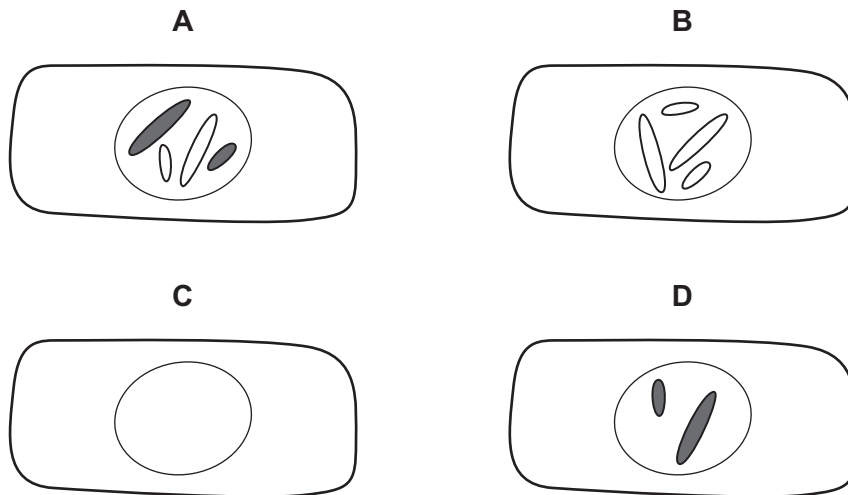
Which of these fruits have an adaptation for seed dispersal by animals?

	X	Y	Z
<b>A</b>	✓	x	✓
<b>B</b>	✓	x	x
<b>C</b>	x	✓	✓
<b>D</b>	x	✓	x

10 The diagram shows a cell that is about to divide by meiosis.



Which cell could be the result of this division?



11 What is **not** a possible outcome in the offspring of two homozygous parents?

- A all heterozygous
- B all homozygous dominant
- C all homozygous recessive
- D 3 heterozygous : 1 homozygous

12 Which processes change the amount of carbon dioxide in the air?

	process causing increase in carbon dioxide	process causing decrease in carbon dioxide
A	burning fossil fuels	photosynthesis in plants
B	photosynthesis in plants	respiration in animals
C	respiration in animals	respiration in plants
D	respiration in plants	burning fossil fuels

13 Which row shows an effect of a human activity on the environment?

	activity	effect
<b>A</b>	cutting down forests	acid rain
<b>B</b>	cutting down forests	eutrophication
<b>C</b>	overuse of fertilisers	acid rain
<b>D</b>	overuse of fertilisers	eutrophication

14 Which statement about atoms is correct?

- A** All atoms contain equal numbers of neutrons and protons.
- B** All atoms of the same element have the same number of neutrons.
- C** The Periodic Table lists atoms in increasing mass number.
- D** The smallest unit of an element is an atom.

15 Pure copper chloride can be obtained from a mixture of powdered copper and solid copper chloride.

Three stages in the method are listed.

- P add water and stir
- Q crystallise
- R filter

In which order are these stages carried out in order to obtain pure copper chloride from the mixture?

- A** P → Q → R
- B** P → R → Q
- C** R → P → Q
- D** R → Q → P

16 Which elements form an ionic compound together?

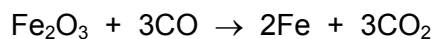
- A** carbon and hydrogen
- B** chlorine and hydrogen
- C** fluorine and potassium
- D** hydrogen and nitrogen

17 The formula of ethanol is C<sub>2</sub>H<sub>5</sub>OH.

How many different elements are present in ethanol?

- A 1                      B 3                      C 4                      D 9

18 The equation for the reaction of iron oxide with carbon monoxide is shown.



Which mass of iron oxide produces 14.8 tonnes of iron?

- A 5.18 tonnes  
B 10.36 tonnes  
C 21.14 tonnes  
D 42.29 tonnes

19 Which elements are formed at the electrodes during the electrolysis of concentrated aqueous sodium chloride?

	anode	cathode
A	chlorine	hydrogen
B	chlorine	sodium
C	hydrogen	chlorine
D	sodium	chlorine

20 The temperature of solution Q is 21 °C. The temperature of solution P is 24 °C.

The two solutions are mixed. The temperature of the mixture is 31 °C.

Which statement is correct?

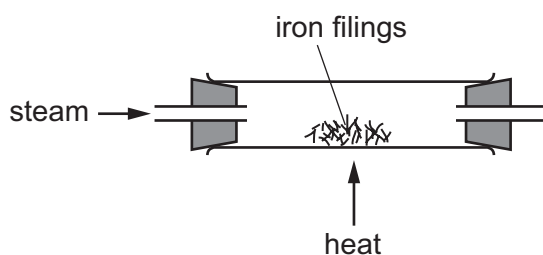
- A An endothermic reaction occurs and the reacting chemicals gain energy.  
B An endothermic reaction occurs and the reacting chemicals lose energy.  
C An exothermic reaction occurs and the reacting chemicals gain energy.  
D An exothermic reaction occurs and the reacting chemicals lose energy.

21 Magnesium and hydrochloric acid react with each other.

Which conditions produce the greatest rate of reaction?

- A high temperature, magnesium powder and concentrated acid
- B high temperature, magnesium ribbon and dilute acid
- C low temperature, magnesium powder and dilute acid
- D low temperature, magnesium ribbon and concentrated acid

22 When iron is heated with steam, a black solid is formed.



The equation for the reaction is shown.



Which statement about this reaction is correct?

- A Iron has been oxidised because it has gained oxygen.
- B Iron has been reduced because it removed oxygen from water.
- C Iron oxide has been reduced because it contains oxygen.
- D Water has been oxidised because it contains oxygen.

23 Oxide P dissolves in water. Adding sodium carbonate to this solution produces a gas.

Oxide Q dissolves in a solution of oxide P. This mixture turns Universal Indicator paper green.

Which row classifies P and Q?

	P	Q
<b>A</b>	acidic	basic
<b>B</b>	acidic	neutral
<b>C</b>	basic	acidic
<b>D</b>	basic	neutral

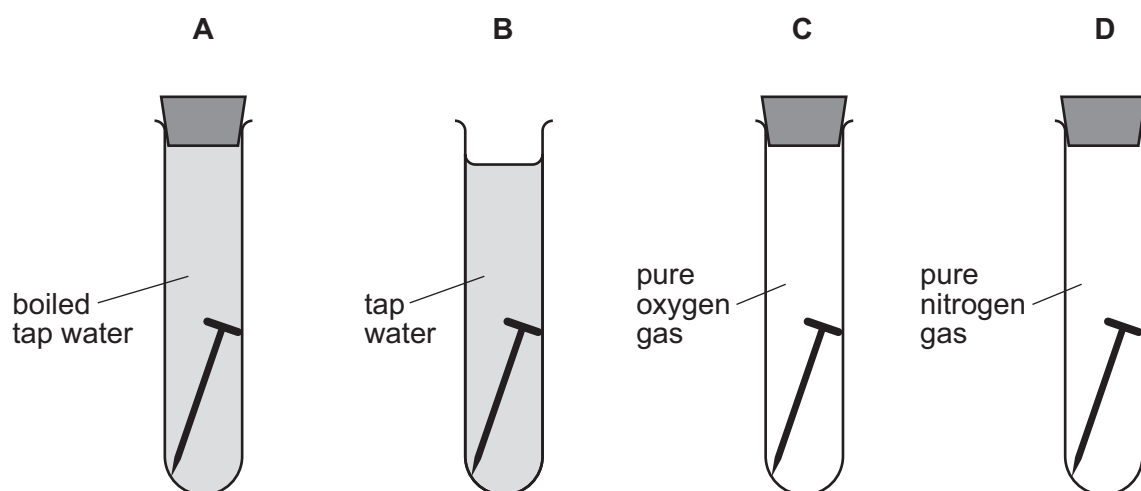


24 Which metal is used to galvanise steel?

- A copper
- B iron
- C magnesium
- D zinc

25 Four iron nails are placed in four test-tubes as shown.

In which test-tube does the iron nail rust most quickly?



26 During the manufacture of sulfuric acid by the Contact process, sulfur trioxide is produced.

The sulfur trioxide is dissolved in concentrated sulfuric acid.

Which statement explains why sulfur trioxide is **not** dissolved in water?

- A The reaction is too endothermic.
- B The reaction is too exothermic.
- C The reaction is too slow.
- D The reaction needs a high pressure.

27 Alkanes and alkenes are different types of hydrocarbon.

Each forms a homologous series.

Which statement about the members within each homologous series is **not** correct?

- A Their boiling points increase as the number of carbon atoms increases.
- B They have similar chemical properties.
- C They have the same general formula.
- D They have the same molecular formula.

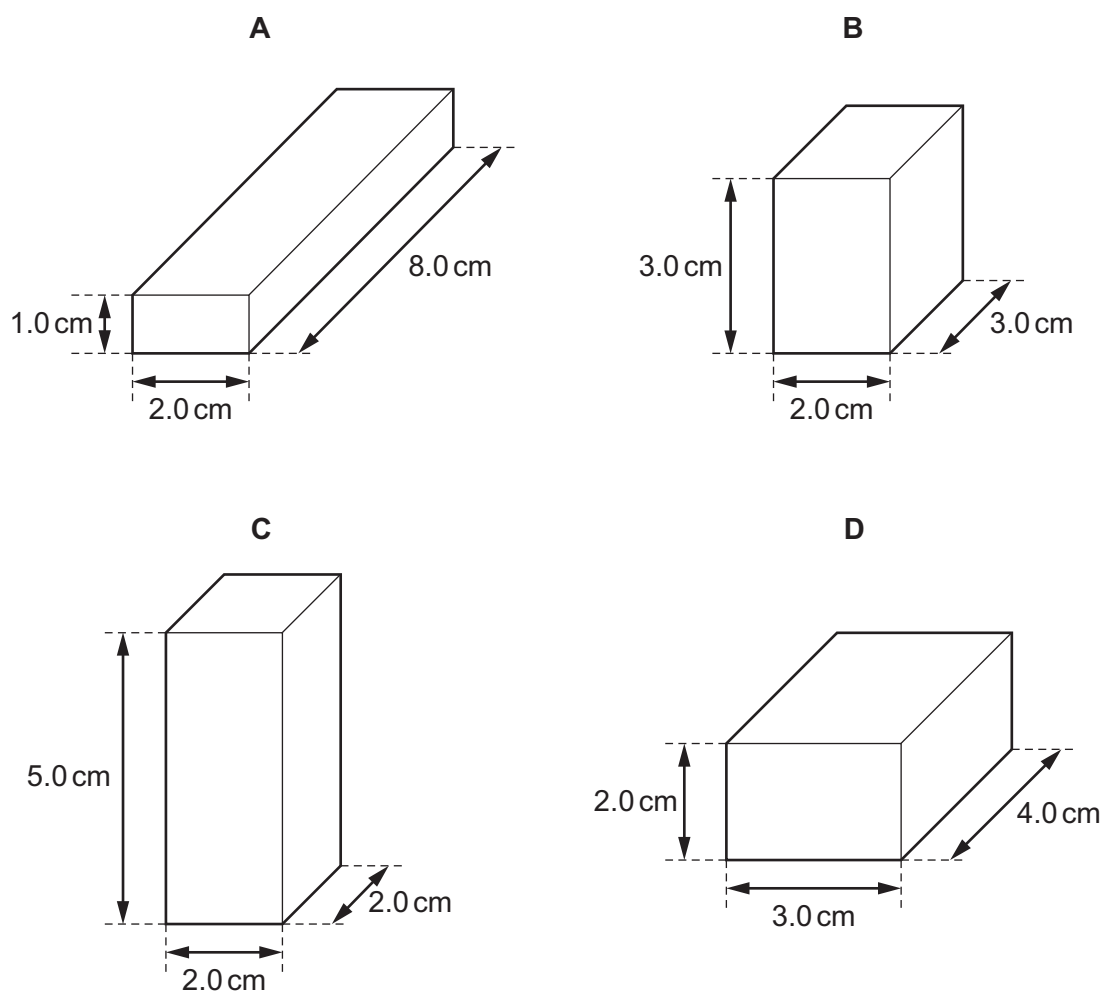
28 A student plots a speed-time graph for a car that is travelling at constant speed.

What can be stated about the velocity of the car, and how can the distance travelled by the car be obtained?

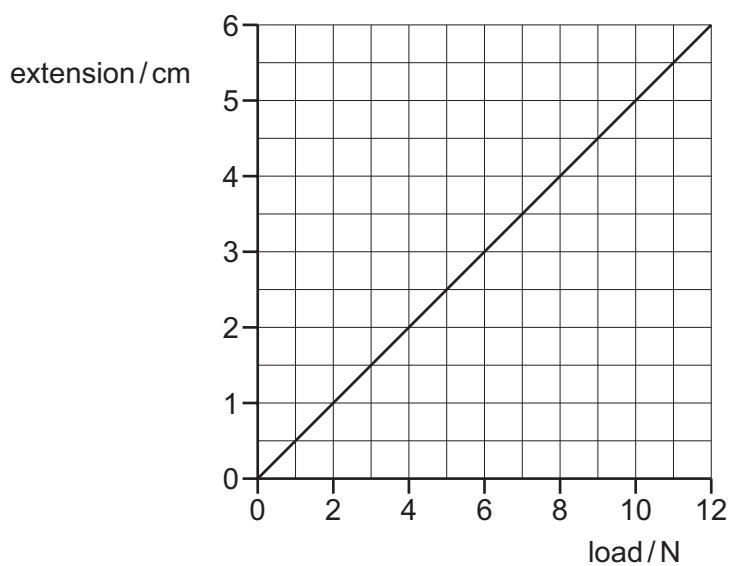
	velocity	distance travelled
<b>A</b>	is constant	area under graph
<b>B</b>	is constant	gradient of graph
<b>C</b>	need not be constant	area under graph
<b>D</b>	need not be constant	gradient of graph

29 The diagrams show four solid blocks with the same mass.

Which block is made from the **least** dense material?



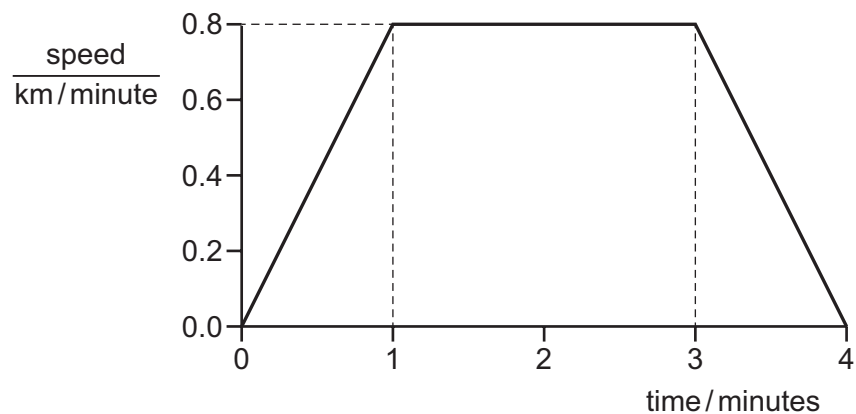
- 30 The diagram shows the extension-load graph for a spring. The length of the unloaded spring is 4.0 cm.



A load is hung from the spring and the length of the spring increases to 5.0 cm.

What is the value of the load?

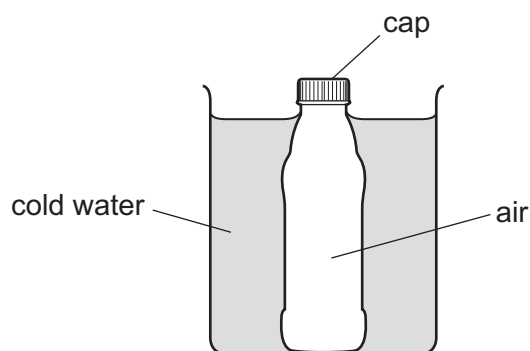
- A** 0.5 N      **B** 2.0 N      **C** 8.0 N      **D** 10 N
- 31 The speed-time graph represents the journey of a bicycle.



What is the total distance travelled by the bicycle?

- A** 1.6 km      **B** 2.0 km      **C** 2.4 km      **D** 3.2 km

- 32 A glass bottle containing warm air is sealed with a screw cap and then cooled in cold water.



The contraction of the glass bottle can be ignored.

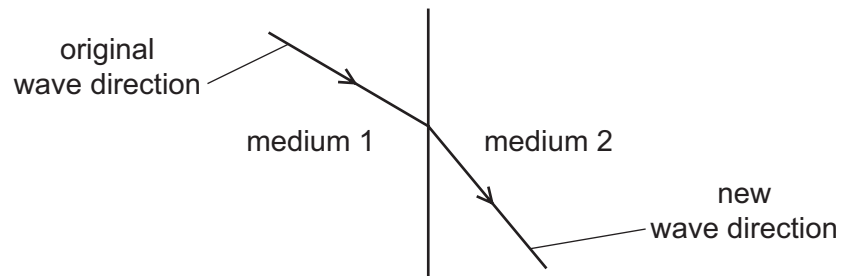
What remains the same during the cooling?

- A the air pressure inside the bottle
  - B the energy of the air molecules in the bottle
  - C the force on the cap made by the air molecules in the bottle
  - D the volume of air in the bottle
- 33 Object P has a smaller thermal capacity than object Q.
- What can be deduced from this about P and Q?
- A P needs less thermal energy to change its state than Q.
  - B P needs less thermal energy to raise its temperature by  $1.0^{\circ}\text{C}$  than Q.
  - C P needs more thermal energy to change its state than Q.
  - D P needs more thermal energy to raise its temperature by  $1.0^{\circ}\text{C}$  than Q.
- 34 A solid piece of metal is placed in a hot furnace. The temperature of the metal increases, then stays constant for a period of time and then increases again.

What is happening to the metal during the period of constant temperature?

- A It is boiling.
- B It is condensing.
- C It is melting.
- D It is solidifying.

- 35 A wave passes from medium 1 into medium 2. The diagram shows the change in direction of the wave.



How do the frequency and the wavelength of the wave change, if at all, as it passes from medium 1 into medium 2?

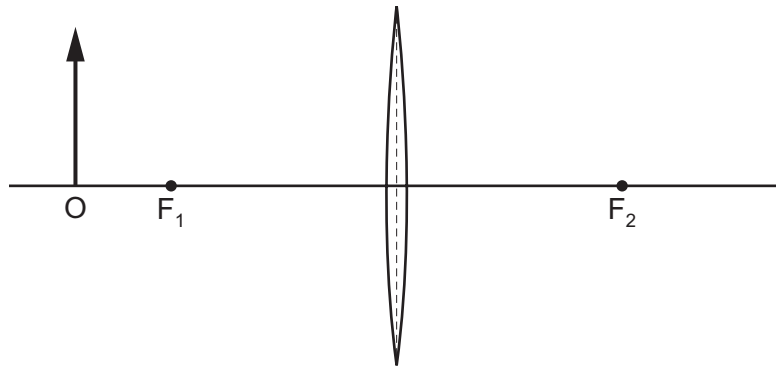
	frequency	wavelength
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	no change	decreases
<b>D</b>	no change	increases

- 36 Light undergoes total internal reflection in an optical fibre.

Which statement explains why this reflection occurs?

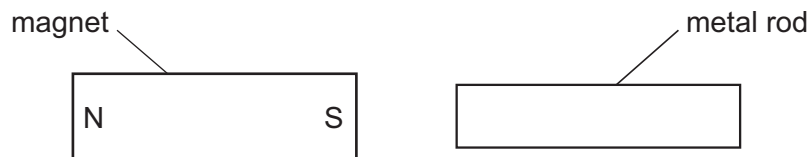
- A** The angle of incidence is equal to the angle of refraction.
- B** The angle of incidence is greater than the angle of reflection.
- C** The angle of incidence is greater than the critical angle.
- D** The angle of incidence is less than the critical angle.

- 37 The diagram shows an object O near a thin converging lens. One principal focus is labelled  $F_1$  and the other is labelled  $F_2$ .



Where is the image of the object formed?

- A to the left of the object
  - B between  $F_1$  and the lens
  - C between the lens and  $F_2$
  - D to the right of  $F_2$
- 38 A bar magnet is brought near to a metal rod.



The magnet is now turned around so that the N-pole is on the right. The magnet is again brought near to the metal rod.

In both cases the metal rod is attracted to the magnet.

What could the metal rod be?

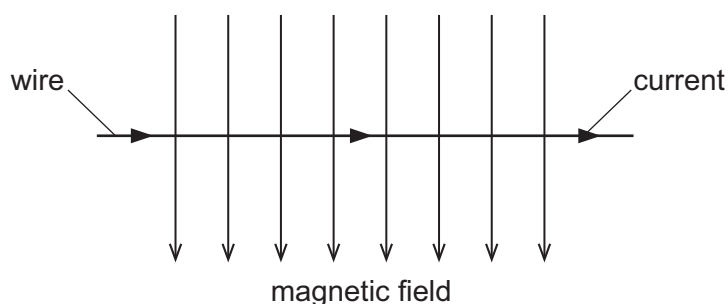
- A another bar magnet
- B a piece of aluminium
- C a piece of copper
- D a piece of iron

- 39 The temperature of a thermistor is increased, and the brightness of the light falling on a light-dependent resistor (LDR) is increased.

What happens to the resistance of each component?

	resistance of thermistor	resistance of LDR
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	increases	decreases
<b>D</b>	increases	increases

- 40 The diagram shows a wire in a magnetic field. There is a current in the wire in the direction shown. The direction of the magnetic field is also shown.



The magnetic field causes a force on the wire.

In which direction does this force act?

- A** into the page
- B** out of the page
- C** towards the bottom of the page
- D** towards the top of the page

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The Periodic Table of Elements

		Group																																																																																		
I	II	III	IV	V	VI	VII	VIII																																																																													
3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9	1 <b>H</b> hydrogen 1	5 <b>B</b> boron 11	6 <b>C</b> carbon 12	7 <b>N</b> nitrogen 14	8 <b>O</b> oxygen 16	9 <b>F</b> fluorine 19	10 <b>Ne</b> neon 20	11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24	13 <b>Al</b> aluminium 27	14 <b>Si</b> silicon 28	15 <b>P</b> phosphorus 31	16 <b>S</b> sulfur 32	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 40	19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	21 <b>Sc</b> scandium 45	22 <b>Ti</b> titanium 48	23 <b>V</b> vanadium 51	24 <b>Cr</b> chromium 52	25 <b>Mn</b> manganese 55	26 <b>Fe</b> iron 56	27 <b>Co</b> cobalt 59	28 <b>Ni</b> nickel 59	29 <b>Cu</b> copper 64	30 <b>Zn</b> zinc 65	31 <b>Ga</b> gallium 70	32 <b>Ge</b> germanium 73	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84	37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium —	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	50 <b>Sn</b> tin 119	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131	55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	81 <b>Tl</b> thallium 204	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	85 <b>At</b> astatine —	86 <b>Rn</b> radon —	87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	89–103 actinoids	104 <b>Rf</b> rutherfordium —	105 <b>Db</b> dubnium —	106 <b>Sg</b> seaborgium —	107 <b>Bh</b> bohrium —	108 <b>Hs</b> hassium —	109 <b>Mt</b> meitnerium —	110 <b>Ds</b> darmstadtium —	111 <b>Rg</b> roentgenium —	112 <b>Cn</b> copernicium —	114 <b>Fl</b> flerovium —	116 <b>Lv</b> livermorium —

**Key**

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 <b>La</b> lanthanum 139	58 <b>Ce</b> cerium 140	59 <b>Pr</b> praseodymium 141	60 <b>Nd</b> neodymium 144	61 <b>Pm</b> promethium —	62 <b>Sm</b> samarium 150	63 <b>Eu</b> europium 152	64 <b>Gd</b> gadolinium 157	65 <b>Tb</b> terbium 159	66 <b>Dy</b> dysprosium 163	67 <b>Ho</b> holmium 165	68 <b>Er</b> erbium 167	69 <b>Tm</b> thulium 169	70 <b>Yb</b> ytterbium 173	71 <b>Lu</b> lutetium 175
actinoids	89 <b>Ac</b> actinium —	90 <b>Th</b> thorium 232	91 <b>Pa</b> protactinium 231	92 <b>U</b> uranium 238	93 <b>Np</b> neptunium —	94 <b>Pu</b> plutonium —	95 <b>Am</b> americium —	96 <b>Cm</b> curium —	97 <b>Bk</b> berkelium —	98 <b>Cf</b> californium —	99 <b>Es</b> einsteinium —	100 <b>Fm</b> fermium —	101 <b>Md</b> mendelevium —	102 <b>No</b> nobelium —	103 <b>Lr</b> lawrencium —

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).